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Study of Incidence of Malaria, Dengue and Chikungunya Fevers among Febrile Patients Visiting Tertiary Care Hospital

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ABSTRACT
Vector-borne diseases including malaria, dengue, and chikungunya remain significant public health concerns in tropical and subtropical regions, necessitating comprehensive epidemiological studies to guide prevention and control strategies. This prospective observational study was conducted over six months among febrile patients attending the In-Patient Department of General Medicine at King George Hospital, Visakhapatnam. Following Institutional Ethics Committee approval and informed written consent, detailed clinical histories and examinations were performed on all enrolled patients, with data analysis conducted using SPSS software and appropriate statistical techniques. Among 100 patients studied, males predominated (52%) compared to females (48%), with malaria accounting for 72% of cases, dengue 24%, and chikungunya 4%, reflecting the higher prevalence of vector-borne diseases among males attributed to increased outdoor occupational activities and greater exposure to day-biting mosquitoes. The highest prevalence was observed in the 13–35 years age group, consistent with other Indian epidemiological studies, as active adults engage in more outdoor work, thereby increasing infection risk. Gender-specific analysis revealed notable differences: females were more affected by malaria (55.5%), males predominated in dengue infections (66.6%), while chikungunya affected both genders equally (50%). Seasonal trends demonstrated that infection rates commenced rising in August, peaked in September and October, and coincided with increased mosquito activity during monsoon and post-monsoon periods, particularly facilitating dengue vector transmission. Clinical complications varied by infection type: malaria presented with thrombocytopenia, jaundice, anemia, acute kidney injury, hepatitis, and pneumonia, while dengue manifested with thrombocytopenia, acute kidney injury, and jaundice. Co-infections of malaria with dengue and dengue with chikungunya were documented. Geographic analysis revealed higher disease prevalence in rural areas including Paderu, Chodavaram, Pendurthi, Gajuwaka, Anakapalli, and surrounding villages, with Plasmodium falciparum and Aedes aegypti vectors predominating in these regions. Environmental factors such as marshy areas, inadequate sanitation, unplanned urbanization, and construction activities provided optimal breeding grounds for mosquito vectors. In tribal and high-humidity regions of Visakhapatnam, parasite growth contributed to life-threatening disease manifestations. Prevention strategies recommended include promoting awareness regarding clean living conditions, distribution and utilization of mosquito coils and insecticide-treated nets, and implementation of government-led vector control and disease prevention programs. As this hospital-based observational study encompassed a limited sample size with fewer patients presenting with febrile symptoms, the findings may not be generalizable to the broader population. Future investigations should prioritize larger-scale, longitudinal studies with extended follow-up periods to validate these findings and provide more robust epidemiological data for guiding public health interventions in endemic regions.
Keywords: Vector-borne diseases, malaria, dengue, chikungunya, epidemiology

INTRODUCTION

Malaria

Malaria is a major public health concern, affecting approximately 36% of the global population (about 2,020 million people across 107 countries and territories in tropical and subtropical regions) (WHO). India contributes nearly 70% of malaria cases in the WHO South-East Asia Region. Annually, India reports around two million cases and 1,000 deaths, with an increasing share attributed to Plasmodium falciparum (A.P. Dash et al., 2015). High-burden populations include ethnic tribes in forested areas of Odisha, Jharkhand, Madhya Pradesh, Chhattisgarh, and the North-Eastern states, which collectively account for the majority of morbidity and mortality. Challenges to malaria control include drug and insecticide resistance, incomplete disease burden data, and emerging transmission patterns (A.P. Dash et al., 2015).

Malaria Parasite Species in India

The predominant species are Plasmodium falciparum and P. vivax.P. malariae occurs in parts of eastern India, while P. ovale is extremely rare (Ashwani Kumar et al., 2014).Species distribution varies: P. vivax predominates in Tamil Nadu, P. falciparum in Odisha, while mixed infections are common in Gujarat.

Epidemiology: India accounts for about 70% of malaria cases in the WHO South-East Asia Region Globally, malaria is among the top infectious disease burdens, alongside diarrhea, HIV/AIDS, tuberculosis, measles, hepatitis B, and pneumonia, together representing 85% of the infectious disease burden (Ashwani Kumar et al., 2014) Worldwide estimates: 300–500 million cases annually, with 90% in Africa. Annual mortality ranges from 700,000 to 2.7 million, with African children and pregnant women most affected.

Etiology: Malaria is caused by protozoan parasites of the genus *Plasmodium*, transmitted by bites from female *Anopheles* mosquitoes. Transmission may also occur via infected blood or blood products**.**m five species infect humans: *P. falciparum*, *P. vivax*, *P. ovale*, *P. malariae*, and *P. knowlesi* (A.P. Dash et al., 2015) *P. falciparum* and *P. vivax* account for most infections, with *P. falciparum* responsible for the most severe disease.

Signs and Symptoms

Common features: Fever, headache, myalgia, arthralgia, anorexia, nausea, vomiting (Noppadon Tangpukdee et al., 2008). Malaria often mimics other infections, so alternative diagnoses should be considered in the presence of Respiratory symptoms (e.g., cough, runny nose) Gastrointestinal issues (e.g., diarrhea, dysentery, abdominal pain) Genitourinary complaints (e.g., burning micturition) Skin rashes, abscesses, lymphadenopathy Ear discharge or painful swollen joints

Diagnosis

Current diagnostic methods include:

Microscopy (gold standard) – identifies parasite species, density, and developmental stages

Rapid Diagnostic Tests (RDTs)

Useful in resource-limited settings.

Polymerase Chain Reaction (PCR)

Highly sensitive, detects low-density infections, used mainly in advanced facilities (Matthew R. Boyce et al., 2014).

METHODOLOGY

Study Area: The study was conducted in Visakhapatnam district**,** Andhra Pradesh, which ranks 44th nationally and 5th in the state in terms of population, covering a geographical area of **11.24 lakh hectares** with an extended coastline.

Geographical coordinates: Latitude 17°15′–18°32′ N and longitude 18°54′–83°30′ E.

Climate: Hottest month is May (average ~32°C), coolest month is January (average ~23°C). Humidity remains high throughout the year.

Healthcare Infrastructure: The district comprises 43 mandals **and** 86 primary health centres**.** The study was carried out at King George Hospital (KGH), Visakhapatnam**,** a 1237-bed government general hospital serving north coastal Andhra Pradesh and parts of Odisha. Study Period: November 2024 – April 2025

Sample Size: n = 100 patient

Inclusion Criteria: Febrile patients (13–60 years) with Recent or current fever (within the last 2–4 days)Symptoms such as chills, headache, joint pain, muscle aches, or generalized body pain Patients selected based on physician's recommendation for malaria, dengue, or chikungunya testing.

Exclusion Criteria:

Pregnant and lactating women Patients aged <13 years **or** >60 years Data Collection Data collected **over** 6 months **from** in-patients in the Department of General Medicine, KGH **p**atient details recorded: age, sex, occupation, habits (alcohol, smoking), complications, co-infections, prescribed medications. Statistical Analysis Data entered in Microsoft Excel**.** Statistical analysis performed using Excel STAT and SPSS**.**

Ethical Approval

Institutional Ethics Committee (IEC) approval obtained (Regd. No. ECR/197/Inst/KGH/2013/DCGI/20-04-2013) Ethics meeting held on **22 October 2014**, at 1:50 pm, King George Hospital, Visakhapatnam. The study protocol was approved.

Patient Consent

A **written informed consent form (ICF)** was administered to each participant. Subject profile data included demographics, medical history, co-morbidities, and treatment details

RESULTS AND DISCUSSION

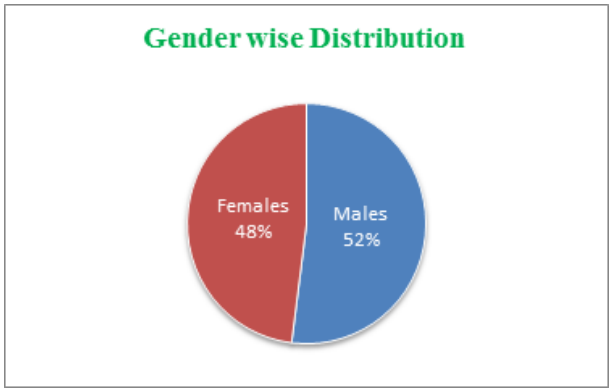

Fig.1: Gender wise distribution of Malaria, Dengue and Chikungunya

Table.1: Gender wise Distribution of Malaria, Dengue and Chikungunya

Gender wise distribution of malaria, dengue and chikungunya	
Males	Females
52	48
Total :100	

Discussion:

From the Table No.1 During the study period total 100 patinets were noted from this total males are n=52 dominant than females n=48 in accoradance with the other studies conducted in India by (A P Dash *et al*., "Malaria in India: Challenges and opportunities" 2015).

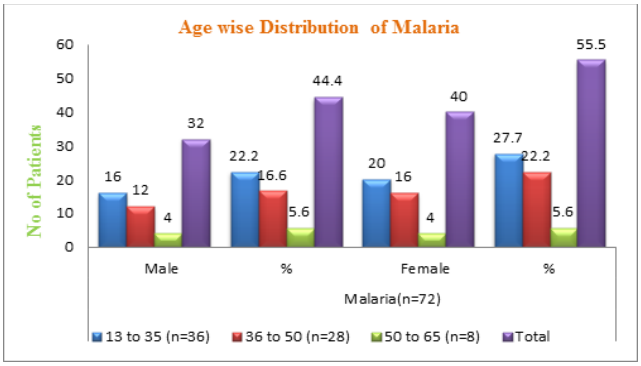

Fig.2: Age wise Distribution of Malaria

Discussion: It is observed that females were more affected by malaria in the age groups 13–35 years (n = 20) **and** 36–50 years (n = 16)**.** In the age group 51–65 years, both males (n = 4) and females (n = 4) were equally affected. The calculated odds ratio was 1.25 with $p < 0.4$, indicating no statistically significant difference. These findings are in line with the epidemiological data reported by the National Vector Borne Disease Control Programme (NVBDCP) **and** WHO (2015–2016)**,** as well as the study by **A. P. Dash et al.,** "Malaria in India: Challenges and Opportunities" (2015).

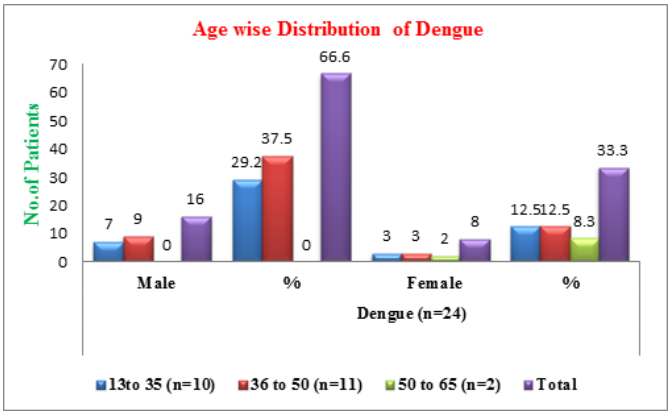

Fig.3: Age wise Distribution of Dengue

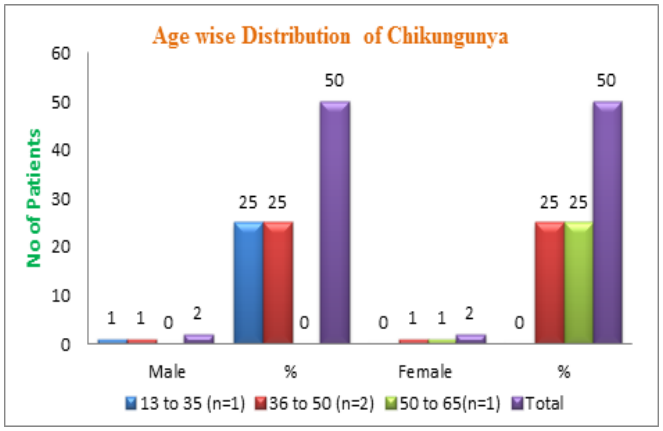

Fig.4: Age wise Distribution of Chikungunya

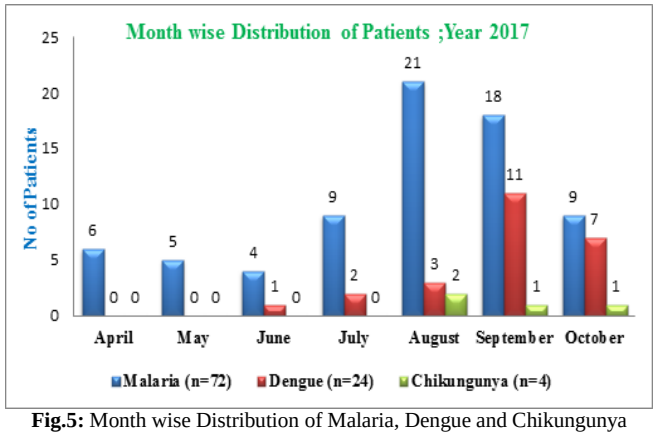

Fig.5: Month wise Distribution of Malaria, Dengue and Chikungunya

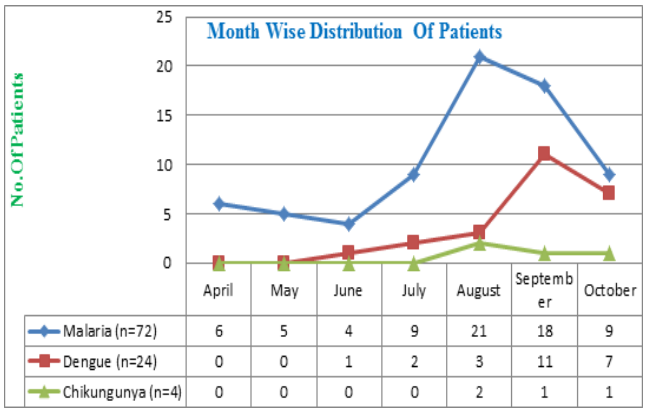

Fig.6: Month wise Distribution of Malaria, Dengue and Chikungunya

CONCLUSION

- The present study is a **prospective observational study** conducted over a period of **six months (180 days)** among patients attending the **In-Patient Department of General Medicine at King George Hospital, Visakhapatnam**, who met the inclusion and exclusion criteria.
- Following **approval from the Institutional Ethics Committee** and informed consent from the patients, detailed **clinical history and examination** were performed. The collected data were tabulated and analyzed using **SPSS software** and appropriate **statistical techniques**.
- The study observed a **higher prevalence of malaria, dengue, and chikungunya fevers in males (52%) compared to females (48%)**, with malaria accounting for **72%**, dengue **24%**, and chikungunya **4%** of cases. These findings correlate with other studies from **North and South India**, where the higher prevalence among males is attributed to greater outdoor activities, increasing their exposure to day-biting mosquitoes.
- The **highest prevalence was noted in the 13–35 years age group**, consistent with other Indian studies, likely because active adults engage in more outdoor work, increasing the risk of infection.
- Gender-specific trends showed that **females were more affected in malaria (55.5%)**, **males predominated in dengue (66.6%)**, and chikungunya affected **both genders equally (50%)**.
- **Seasonal analysis** revealed that infections began rising in **August**, peaked in **September and October**, reflecting the increased **mosquito activity during monsoon and post-monsoon seasons**, particularly for dengue transmission.

Several **complications** were observed:

Malaria: thrombocytopenia, jaundice, anemia, acute kidney injury, hepatitis, and pneumoni

Dengue: thrombocytopenia, acute kidney injury, jaundice.

Co-infections were also documented, including **malaria with dengue** and **dengue with chikungunya**.

- Patients from **rural areas** such as Paderu, Chodavaram, Pendurthi, Gajuwaka, Anakapalli, and surrounding villages were more affected, particularly by **Plasmodium falciparum** and **Aedes aegypti** vectors. Females showed higher susceptibility to **P. falciparum** compared to **P. vivax**. Environmental factors such as **marshy areas, poor sanitation, unplanned urbanization, and construction activities** provided ideal breeding grounds for mosquitoes. In **tribal and high-humidity regions** of Visakhapatnam, the growth of parasites contributed to life-threatening diseases.
- **Preventive measures** should focus on:
  - Awareness regarding **clean living conditions**
  - Use of **mosquito coils and insecticide-treated nets**
  - **Government-led awareness programs** for vector control and disease prevention
- As this study is a **hospital-based observational study with a small sample size**, and fewer patients reporting febrile or related symptoms, the results may **not be generalizable to the wider population**. Therefore, it is **recommended** that larger, longitudinal studies with

follow-up be conducted in the future to validate these findings.

CONFLICT OF INTERESTS
The authors declare no conflict of interest

ETHICS APPROVAL
Not applicable

FUNDING
This study received no specific funding from public, commercial, or not for profit funding agencies.

AI TOOL DECLARATION
The authors declare that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY
Data will be available on request

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